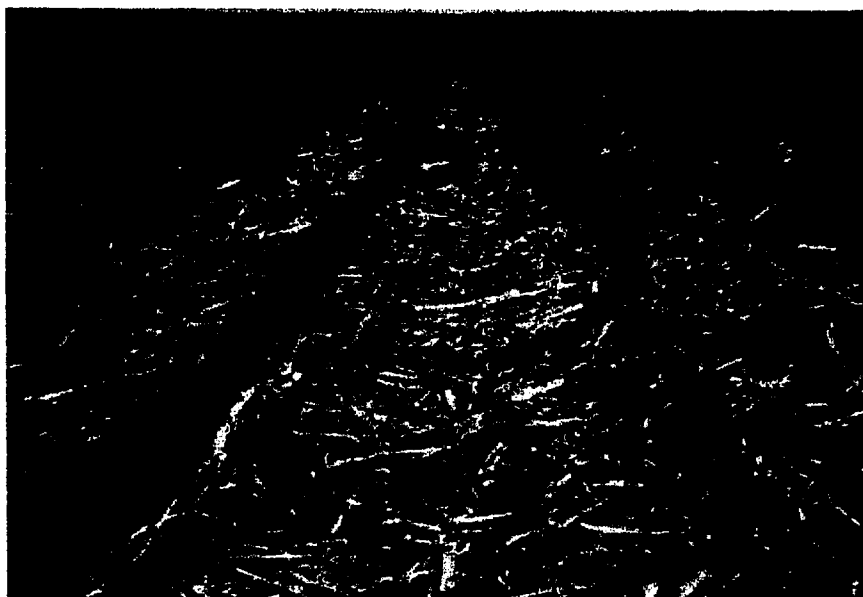


FARM WATER QUALITY PLANNING MANAGEMENT PRACTICE

Residue Management

329

*University of California Cooperative Extension
Natural Resources Conservation Service*



Residue Management consists of managing the amount and distribution of plant residues on the soil surface seasonally or on a year-round basis. The purpose is to reduce sheet, rill, and wind erosion; maintain or improve soil organic matter; conserve soil moisture; and provide cover for wildlife. Methods of management include no-till, strip-till, mulch-till, and ridge till.

This practice is an alternative to conventional tillage that incorporates all crop residue and leaves bare soil exposed during fallow periods.

Advantages

- Pesticides may be tied-up and less likely to be carried to surface or ground water.
- Soil detachment, soil dispersion and soil compaction is reduced.
- Residues trap sediment, promote soil aggregation and improve soil tilth.

Disadvantages

- May harbor plant pathogens
- Planting equipment must be modified
- May require increased use of pesticides
- Increased infiltration could result in increased leaching of dissolved pollutants to ground water

Practice Effectiveness for Reducing Water Quality NPS Pollution Potential

Erosion-sheet & rill	Erosion-streambank	Pesticides-leaching	Pesticides-dissolved in runoff	Pesticides-adsorbed to sediment	Nutrients-leaching	Nutrients-surface waters
moderate to significant						

Empty boxes indicate information not yet collected for this practice

Additional sources of information regarding residue management:

UC Sustainable Agriculture Research and Extension Program <http://www.sarep.ucdavis.edu/>
 UC Weed Research and Information Center <http://wric.ucdavis.edu/>

Some of the information in this management sheet has been taken from the Natural Resource Conservation Service (NRCS) Handbook of Conservation Practices practice #329. Contact your local NRCS office or visit <http://www.nrcs.usda.gov> for more information.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE SPECIFICATION

329A - RESIDUE MANAGEMENT, NO-TILL AND STRIP TILL

I. SCOPE

The work shall consist of performing cultural operations to produce crops or hay in a manner that maintains acceptable yields and provides adequate residues on the soil surface from harvest until after the next planting, on the area of land as shown on the plans or as staked in the field.

II. MATERIALS

Chemicals used in performing this practice shall be Federally, State, and locally registered and shall be applied strictly in accordance with authorized registered uses, directions on the label, and other Federal, State and local policies and requirements.

Chemical containers shall be properly stored and disposed of in a safe manner according to state and local ordinances or procedures.

III. CULTURAL OPERATIONS

In rainfall erosion areas, the tillage and planting system shall provide at least 30 percent coverage of the soil surface with plant residues after planting a crop unless otherwise specified on the Practice Requirements sheet. The soil shall be left undisturbed from harvest to planting except for nutrient injection. Planting or drilling shall be accomplished in a narrow seedbed or slot created by coulters, row cleaners, disk openers, in-row chisels or roto-tillers.

In wind erosion areas, the tillage and planting system shall maintain at least 1000 pounds per acre of flat, small grain residue equivalent on the soil surface throughout the critical wind erosion period unless otherwise specified on the Practice Requirement sheet. The soil shall be left undisturbed from harvest to planting except for nutrient injection. Planting or drilling shall be accomplished in a narrow seedbed or slot created by coulters, row cleaners, disk openers, in-row chisels or roto-tillers.

Planting shall be performed as nearly as practical across the slope.

Planting or drilling shall be accomplished in a narrow seedbed or slot that generally does not exceed three (3) inches in width.

Planting shall be performed directly into old crop residues, annual cover crop, or chemically killed sods.

Combines used to harvest small grains shall be equipped with a straw spreader.

Weed control shall be accomplished primarily with herbicides. Cultivation may be used for emergency weed control.

IV. OTHER REQUIREMENTS

The owner, operator, contractor, or other persons shall conduct all work and operations in accordance with proper safety codes for the type of equipment and operations being performed with due regard to the safety of all persons and property.

NATURAL RESOURCES CONSERVATION SERVICE
CONSERVATION PRACTICE STANDARD

RESIDUE MANAGEMENT, NO-TILL AND STRIP TILL

(Acre)
CODE 329A

DEFINITION

Managing the amount, orientation and distribution of crop and other plant residues on the soil surface year-round, while growing crops in narrow slots or tilled strips in previously untilled soil and residue.

PURPOSES

This practice may be applied as part of a conservation management system to support one or more of the following:

- * Reduce sheet and rill erosion.
- * Reduce wind erosion.
- * Maintain or improve soil organic matter content.
- * Conserve soil moisture.
- * Manage snow to increase plant available moisture or reduce plant damage from freezing or desiccation.
- * Provide food and escape cover for wildlife.

CONDITIONS WHERE PRACTICE APPLIES

This practice applies to all cropland and other land where crops are grown.

This standard includes tillage and planting methods commonly referred to as no-till, zero till, slot plant, row till, zone till, or strip till.

CRITERIA

General Criteria Applicable to All Purposes Named Above

Loose residues to be retained on the field, shall be uniformly distributed on the soil surface. Where combines or similar machines are used for harvesting, they shall be equipped with spreaders capable of

distributing residue over at least 80 percent of the working width of the header.

Residues shall not be burned, or disturbed by full width tillage operations except as follows:

Planters or drills shall be equipped to plant directly through untilled residue or in a tilled seedbed prepared in a narrow strip along each row by planter attachments such as rotary tillers, sweeps, multiple coulters, or row cleaning devices.

If row cultivation or spot treatment for weed escapes, leveling ruts, or similar operations become necessary, tillage shall be limited to undercutting operations which minimize burial of surface residue.

Additional Criteria to Reduce Sheet and Rill Erosion

The amount of residue needed to reduce erosion within the soil loss tolerance (T) or any other planned soil loss objective, shall be determined using current approved erosion prediction technology. Partial removal of residue by means such as baling or grazing, shall be limited to retain the amount needed. Calculations shall account for the effects of other practices in the conservation management system.

Seedbed preparation, planting, and fertilizer placement shall disturb no more than one fourth of the row width. The row area formed by the planting operation shall be level with or slightly above the adjacent row middles unless the rows are planted on the contour.

Additional Criteria to Reduce Wind Erosion

The amount and orientation of residue needed to reduce erosion within the soil loss tolerance (T) or other planned soil loss objective shall be determined using current approved wind erosion prediction technology. Partial removal of residue by means such as baling or grazing shall be limited to retain the amount needed. Calculations shall account for the effects of other practices in the conservation management system.

Additional Criteria to Maintain or Improve Soil Organic Matter Content

The amount of residue needed to achieve the desired soil condition, shall be determined using the current approved soil conditioning index procedure. Partial removal of residue by means such as baling or grazing shall be limited to retain the amount needed. Calculations shall account for the effects of other practices in the conservation management system.

Additional Criteria to Conserve Soil Moisture

A minimum quantity of 50 percent residue cover shall be maintained throughout the year. Residue shall be evenly distributed and maintained on the soil surface. Partial removal of residue by means such as baling or grazing shall be limited to retain the amount needed.

Additional Criteria to Manage Snow to Increase Plant Available Moisture or Reduce Plant Damage From Freezing or Desiccation

Stubble shall be left standing as high as possible by the harvesting operation, but not less than 6 inches in any case. Stubble shall be maintained standing over winter to trap and retain snow. Loose residue may be removed providing that the remaining residue is left standing.

When crops are planted in the fall, the width of the tilled strip or slot shall be no more than one fourth of the row width, in order to reduce the disturbance of standing stubble.

Additional Criteria to Provide Food and Escape Cover for Wildlife

Residue height, amount, and time period shall be determined using an approved habitat evaluation procedure. Residues shall not be removed unless it is determined by the habitat evaluation procedure that removal would not adversely affect habitat values.

CONSIDERATIONS

In rainfall erosion areas, the tillage and planting system is used to provide at least 30 percent coverage of the soil surface with plant residues after planting a crop. The soil is left undisturbed from harvest to planting except for nutrient injection. Planting or drilling is accomplished in a narrow seedbed or slot created by coulters, row cleaners, disk openers, in-row chisels or roto-tillers.

In wind erosion areas, the tillage and planting system is used to maintain at least 1000 pounds per acre of flat, small grain residue equivalent on the soil surface throughout the critical wind erosion period. The soil is left undisturbed from harvest to planting except for nutrient injection. Planting or drilling is accomplished in a narrow seedbed or slot created by coulters, row cleaners, disk openers, in-row chisels or roto-tillers.

No-till or strip till may be practiced continuously throughout the crop sequence, or may be managed as part of a system which includes other tillage and planting methods such as mulch till. Selection of acceptable tillage methods for specific site conditions may be aided by an approved Soil Tillage Suitability Rating.

Production of adequate amounts of crop residues necessary for the proper functioning of this practice can be enhanced by selection of high residue producing crops and crop varieties in the rotation, use of cover crops, and adjustment of plant populations and row spacing.

Maintaining a continuous no-till system will maximize the improvement of soil organic matter content. Also, when no-till is practiced continuously, soil reconsolidation provides additional resistance to sheet and rill erosion.

The effectiveness of stubble to trap snow or reduce plant damage from freezing or desiccation increases with stubble height. Variable height stubble patterns may be created to further increase snow storage.

Leaving rows of unharvested crop standing at intervals across the field can enhance the value of residues for wildlife habitat.

Endangered Species Considerations

Determine if installation of this practice with any others proposed will have any effect on any federal or state listed Rare, Threatened or Endangered species or their habitat. NRCS's objective is to benefit these species and others of concern or at least not have any adverse effect on a listed species. If the Environmental Evaluation indicates the action may adversely affect a listed species or result in adverse modification of habitat of listed species which has been determined to be critical habitat, NRCS will advise the land user of the requirements of the Endangered Species Act and recommend alternative conservation treatments that avoid the adverse effects. Further assistance will be provided only if the landowner selects one of the alternative conservation treatments for installation; or

at the request of the landowners, NRCS may initiate consultation with the Fish and Wildlife Service, National Marine Fisheries Service and/or California Department of Fish and Game. If the Environmental Evaluation indicates the action will not affect a listed species or result in adverse modification of critical habitat, consultation generally will not apply and usually would not be initiated. Document any special considerations for endangered species in the Practice Requirements Worksheet.

Some species are year-round residents in some streams, such as, freshwater shrimp. Other species, such as steelhead and salmon, utilize streams during various seasons. Be aware that during critical periods, such as spawning, eggs in gravels and rearing of young may preclude activities in the stream that may directly affect the stream habitat during those periods. For example, there should be no disturbance of stream gravel beds that may have eggs in them. That could include any equipment in the stream or even walking in the stream or work upstream that may result in sediment depositing in the gravel beds. Document any special considerations for endangered species in the Practice Requirements Worksheet.

Water Quantity

This practice has an insignificant effect on the quantity of surface and ground water.

1. Effects on the water budget, especially on volumes and rates of runoff, infiltration and evaporation.
2. Effects of crop residue on soil moisture.
3. Effects of snowcatch and melt on the water budget. Consider managing standing stubble to increase snow catch in water-limited areas.

Water Quality

When this practice is employed, raindrops are intercepted by the residue reducing detachment, soil dispersion, and soil compaction. Erosion may be reduced and the delivery of sediment and associated pollutants to surface may be reduced. Reduced soil sealing, crusting and compaction allows more water to infiltrate, resulting in an increased potential for leaching of dissolved pollutants into the ground water.

Crop residues on the surface increases the microbial and bacterial action on or near the surface. Nitrates and surface-applied pesticides may be tied-up and less available to be delivered to surface and ground water.

Residues trap sediment and reduce the amount carried to surface water. Crop residues promote soil aggregation and improve soil tilth.

1. Filtering effects of crop residue on movement of sediment and dissolved and sediment-attached substances.
2. Effects of crop residue placement on dissolved and sediment-attached nutrient movement.

PLANS AND SPECIFICATIONS

Specifications for establishment and operation of this practice shall be prepared for each field or treatment unit. Specifications shall be recorded using approved specification sheets, job sheets, or other acceptable documentation.

OPERATION AND MAINTENANCE

No operation and maintenance requirements have been identified for this practice.